

**Best
Available
Copy**

AD-A281 306

REPORT DOCUMENT

Form Approved
OMB No. 070-0188

1a. REPORT SECURITY CLASSIFICATION

2a. SECURITY CLASSIFICATION AUTHORITY

2b. DECLASSIFICATION/DOWNGRADING SCHEDULE

4. PERFORMING ORGANIZATION REPORT NUMBER(S)

DISTRIBUTION/AVAILABILITY OF REPORT
Approved for public release;
distribution unlimited.

5. MONITORING ORGANIZATION REPORT NUMBER(S)

6a. NAME OF PERFORMING ORGANIZATION
Northern Illinois University6b. OFFICE SYMBOL
(If applicable)7a. NAME OF MONITORING ORGANIZATION
AFOSR/NL6c. ADDRESS (City, State, and ZIP Code)
Dept of Chemistry
Dekalb, IL 601157b. ADDRESS (City, State, and ZIP Code)
110 Duncan Ave Suite B115
Bolling AFB DC 20332-00018a. NAME OF FUNDING/SPONSORING
ORGANIZATION
AFOSR8b. OFFICE SYMBOL
(If applicable)
NL9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
F49620-92-J-05338c. ADDRESS (City, State, and ZIP Code)
110 Duncan Ave Suite B115
Bolling AFB DC 20332-0001

10. SOURCE OF FUNDING NUMBERS

PROGRAM
ELEMENT NO.
61103DPROJECT
NO.
3484TASK
NO.
RSWORK UNIT
ACCESSION NO.

11. TITLE (Include Security Classification)

(FY92 URI/RIP) DESIGN STRATEGIES FOR THE PREPARATION OF POLYMERIC ORGANIC SUPERCONDUCTORS

12. PERSONAL AUTHOR(S)

Dr Charles W. Spangler

13a. TYPE OF REPORT

ANNUAL

13b. TIME COVERED

FROM 92 Sep TO 93 Sep

14. DATE OF REPORT (Year, Month, Day)

15. PAGE COUNT

7

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD

GROUP

SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This program has, as its stated goal, the design of the first organic polymeric superconductor. In year one we have embarked on the design of several model compounds so as to ascertain the most appropriate synthetic methodology for the polymer systems, and to determine the existence of any potential problems in solubility and processability parameters in the chosen systems. Upon synthesis the redox properties of the model compounds and their compatibility with various counter ions will be determined, as well as their packing efficiency via x-ray spectroscopy.

DTIC QUALITY INSPECTED 2

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT

☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS

21. ABSTRACT SECURITY CLASSIFICATION

22a. NAME OF RESPONSIBLE INDIVIDUAL

Dr Charles Y-C, Lee

22b. TELEPHONE (Include Area Code)

(202) 767-5021

22c. OFFICE SYMBOL

NL

AEOSR-TR- 94 04 14

Interim Technical Report

Approved for public release;
distribution unlimited.

Prepared for: Air Force Office of Scientific Research

Title: "Design Strategies for the Preparation of Polymeric Organic Superconductors"

Grant Number: F49620-92-J-0533 (FY92 URI/RIP)

Grant Period: September 30, 1992 - September 29, 1995

Principal Investigator: Professor Charles W. Spangler

Address: Department of Chemistry
Northern Illinois University
DeKalb, IL 60115

815/753-6880 (Phone)
815/753-4802 (FAX)

Accession For	
NTIS CRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	

94-20938



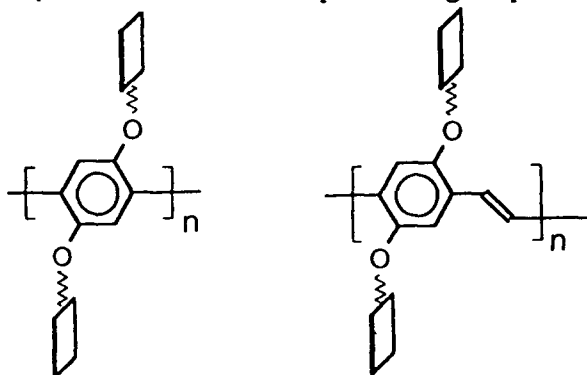
94 7 8 048

Introduction

This program has, as its stated goal, the design of the first organic polymeric superconductor. In year one we have embarked on the design of several model compounds so as to ascertain the most appropriate synthetic methodology for the polymer systems, and to determine the existence of any potential problems in solubility and processibility parameters in the chosen systems. Upon synthesis the redox properties of the model compounds and their compatibility with various counter ions will be determined, as well as their packing efficiency via x-ray spectroscopy.

Synthesis of Model Compounds

In collaboration with Professor John Reynolds of the University of Florida, we determined that the following model compounds would be synthesized at Northern Illinois University during the first year to mimic poly (p-phenylene) and poly (p-phenylene vinylene) with TTF and ET pendant groups:



Our intent is to synthesize the monomer, dimer and trimers with hydrogen end caps and variable length methylene spacers separating the TTF and ET moieties from the rigid rod polymer backbone: $-(CH_2)_n$; $n = 1, 2, 3, \dots$. The synthesis of the first ET molecule with pendant attachment group and a 3-carbon spacer has recently been accomplished and is outlined in schemes 1 and 2. We are currently hydrolyzing compound 7 to the free alcohol, and are attempting to couple it to the hydroquinene dianion. An alternative synthetic approach to this model compound utilizing an "inside-out" strategy is also being studied, and is in the final stage involving coupling of compound 10 to compound 4 by established reaction protocol via asymmetric coupling with $P(OMe)_3$. Both approaches can be carried out in good yield. When the final product has been purified, its' redox properties and electrocrystallization will be studied in collaboration with Professor Reynolds.

The synthesis of the first PPV model compound will also utilize the derivitized ET compound 10, except that it will be coupled to bromo-hydroquinene, and the subsequent product coupled with $Bu_3Sn-CH=CH-SnBu_3$ via Stille coupling. We hope to complete both the final synthesis and electrocrystallization of these materials during year 2.

Personnel

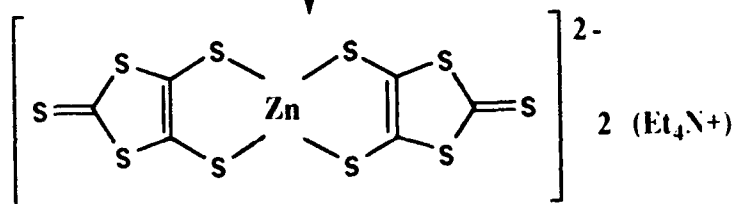
The following postdoctoral students worked on this project during the year.

Dr. Eric Nickel
Dr. Pei-Kang Liu
Dr. Tom Hall
Dr. LinFang Zhu

Drs. Nickel and Liu only worked a few months each before resigning to accept permanent positions.

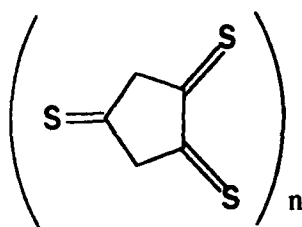
Scheme 1
Na/CS₂/DMF

ZnCl/Et₄N⁺Br⁻



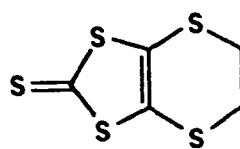
(1)

I₂/EtOH



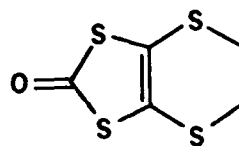
(2)

CH₂BrCH₂Br



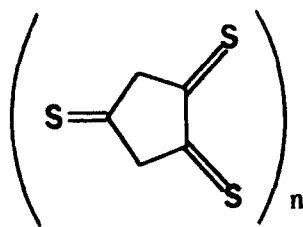
(3)

Hg(OAc)₂

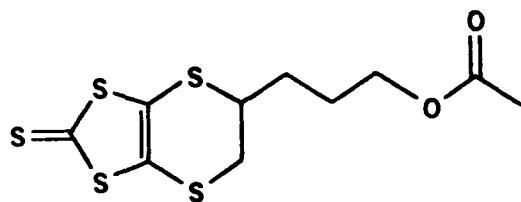
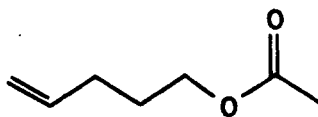


(4)

Scheme 2

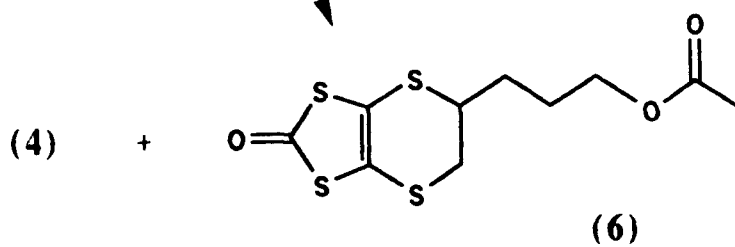


(2)



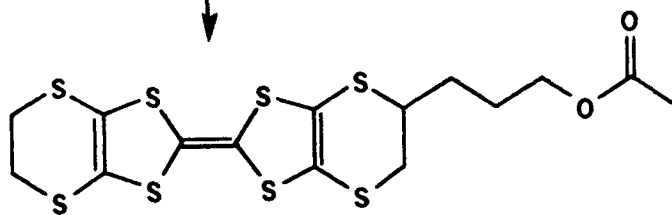
(5)

$\text{Hg}(\text{OAc})_2$



(6)

$\text{P}(\text{OEt})_3$



(7)

Scheme 3

